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ABSTRACT

This study was conducted to evaluate the effectiveness of three methods for promoting use of materials developed by the Texas Nutrition Education and Training (NET) program for use in elementary schools. The methods are: (1) teacher workshops; (2) turnaround sessions; and (3) simple notification. Kindergarten and third grade classes in Austin provided four kinds of data on outcomes of the three methods. Teachers completed a questionnaire describing their acceptance and use of the NET materials, called Health Objectives in Nutrition Education for Youth (HONEY). To measure learning outcomes, nutrition knowledge tests and attitude scales were administered at the beginning and end of the semester, and children's food choices were observed during a classroom activity at the end of the term. Findings revealed that the majority of teachers felt that HONEY was nice to have. Kindergarten teachers in workshop and turnaround groups made the most use of HONEY. Performance on the nutrition knowledge test improved in all groups, with the greatest gains occurring in third grade teacher-notification classes. Little change in attitude scale scores occurred. Good food choices were made more often in third grade teacher notification classes. Thus, although criterion-level teacher performance was most frequent in the workshop group, evaluation of student behaviors showed notification to be a cost-effective approach for promoting nutrition learning in public schools. (Author/RH)

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**A NEW PERSPECTIVE ON THE NEED FOR NUTRITION
EDUCATION IN THE PUBLIC SCHOOLS**

October 1989

**This Paper Was Presented At The Annual Meeting
of the American Evaluation Association
San Francisco, California
and Is Based Upon Research Completed by
Cynthia Roberts-Gray and Susan G. Polasek**

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ABSTRACT

Distributing and promoting use of nutrition education materials for children is a major activity for the Texas Nutrition Education and Training (NET) program. This study was conducted to evaluate relative effectiveness of three methods for promoting use of NET-developed materials in elementary schools: a) teacher workshops, b) turnaround sessions, and c) simple notification. Kindergarten and third grade classes in the Austin Independent School District (AISD) provided four kinds of data with which to evaluate outcomes of these three methods of teacher training. Teachers completed a questionnaire describing their acceptance and use of the NET materials, called Health Objectives in Nutrition Education for Youth (HONEY). To measure learning outcomes, nutrition knowledge tests and attitude scales were administered at the beginning and end of the semester and children's food choices were observed during a classroom activity at the end of the term. Briefly, it was found that the majority of teachers felt that HONEY was nice to have. Kindergarten teachers in workshop and turnaround groups made the most use of HONEY. Performance on the nutrition knowledge test improved in all groups, with the greatest gains occurring in third grade teacher-notification classes. There was very little change in attitude scale scores. Good food choices were made more often in third-grade teacher notification classes. Thus, although criterion-level teacher performance was most frequent in the workshop group, evaluation of student behaviors showed notification to be a cost-effective approach for promoting nutrition learning in public schools.

EXECUTIVE SUMMARY

BACKGROUND AND PURPOSE

Distributing and promoting use of nutrition education materials for children is a major activity for the Texas Nutrition Education and Training (NET) Program. This helps to assure that children are provided with opportunities to learn about and practice good eating habits in schools and child care facilities. Its effects combine with those of other elements of the U.S. Department of Agriculture's Child Nutrition Programs to achieve the goal of optimal health and well-being of the nation's children through improved nutritional status.

This study was conducted to evaluate relative effectiveness of three methods for promoting use of nutrition education materials in elementary schools: a) teacher workshops, b) turnaround sessions, and c) simple notification. The most frequently used method for introducing curriculum innovations in public schools is to provide inservice workshops for teachers. Utility of other, less cost-intensive methods needed to be evaluated, however, because the Texas NET Program has a limited budget and a primary focus on child care settings rather than public schools. Turnaround sessions require that workshops be conducted only for "lead" teachers who then share what they have learned with other teachers on their respective campuses. Simple notification is the least cost-intensive method for encouraging use of new materials, requiring only that teachers be informed that materials are available.

PROCEDURES

Groups of kindergarten and third grade classes on four campuses in the Austin Independent School District (AISD) provided four kinds of data with which to evaluate outcomes of these three methods of teacher training. Teachers completed a questionnaire describing their acceptance and use of the Health Objectives in Nutrition Education for Youth (HONEY), a curriculum developed in AISD during 1985 as a special NET Project. To measure nutrition learning outcomes in their classes, nutrition knowledge tests and

attitude scales were administered at the beginning and end of the fall semester and the children's food choices were observed during a classroom activity at the end of the term. Criterion-references, analysis of variance, and chi-square procedures were applied to compare results of the different teacher training strategies.

RESULTS AND CONCLUSIONS

The majority of teachers agreed that HONEY was nice to have. Kindergarten teachers in workshop and turnaround groups made the most use of HONEY. Performance on the nutrition knowledge test improved in all groups, with the greatest gains occurring in third grade teacher-notification classes. There was very little change in performance on the attitude scales. Good food choices were made more often in third-grade teacher-notification classes. Thus, although the frequency of criterion-level teacher performance appeared to indicate superiority of the workshop approach, evaluation of student food choice behaviors showed notification to be a cost-effective approach for promoting nutrition learning in public schools.

BACKGROUND AND EVALUATION PROBLEM

Distributing and promoting use of nutrition education materials for children is a major activity of the Texas Nutrition Education and Training (NET) Program. By helping teachers provide opportunities for their students to learn about and to practice good eating habits, this activity helps achieve the U.S. Department of Agriculture's goal for its Child Nutrition Programs (CNP): optimal health and well-being of the nation's children through improved nutritional status.

In 1985, the Texas NET Program supported the Austin Independent School District's (AISD) development of the Health Objectives in Nutrition Education for Youth (HONEY) curriculum to address state-mandated essential elements of instruction in health for kindergarten through grade three. HONEY included units on nutrients, food sources, food choices, food handling, and meal planning. It specified learning objectives, described lesson plans, and identified activities and resources to enhance nutrition learning. It encouraged use of the NET Lending Library Collection and use of the school cafeteria as a learning laboratory for good food habits.

Results of the pilot tests of the curriculum conducted by AISD's project staff during the fall of 1986 indicated that use of HONEY improved students' nutrition knowledge. Teachers who piloted the curriculum were very receptive to it, giving the HONEY materials consistently high ratings. Because it appeared to be an effective and attractive nutrition curriculum, NET Program staff began making plans to distribute and promote use of HONEY state-wide.

Workshops are frequently used as a technique for introducing new education materials to teachers. Workshops are relatively expensive, however, and NET Program staff wanted to evaluate the utility of other, less expensive procedures for promoting use of HONEY. Feedback from teachers at schools where HONEY was piloted indicated a generally favorable response to the idea of sending a lead teacher for inservice training, and then having that teacher share information about the new curriculum materials during team meetings with other teachers at the school. This procedure is often referred to as "turnaround." Another relatively less expensive strategy for introducing new materials is simply to place materials at the school and notify teachers of their availability.

During the 1987 school year, AISD agreed to participate in evaluating the relative effectiveness of workshops, turnaround sessions, and simple notification as methods for promoting use of HONEY in its elementary school classrooms. Specifically, three evaluation questions were addressed by this study:

- Do workshops and/or turnaround sessions result in better curriculum implementation and better pupil outcomes than teacher notification?
- Does better curriculum implementation result in relatively better pupil outcomes, in terms of nutrition-related knowledge, attitudes, and behavior?
- Are there differences in the patterns of nutrition instruction and nutrition learning in kindergarten and third grade (the grades of curriculum implementation)?

PROCEDURES

PARTICIPATION

Data were collected to evaluate implementation of HONEY and to measure learner outcomes in kindergarten and third grade classes whose teachers had a) participated in a brief workshop, b) received information about HONEY in a turnaround session, or c) simply been notified that HONEY was available.

Three kindergarten and three third grade classes were assigned to each of the three teacher training methods. An extra kindergarten class was assigned to the turnaround group to yield a total of ten kindergarten and nine third grade classes on four AISD campuses. (Because AISD's research policies required that participation agreements be negotiated with each school's principal and then with individual teachers on a project by project basis, assignment to groups was not random.)

INSTRUMENTATION

Implementation of HONEY was assessed by analyzing teachers' responses to a questionnaire administered at the close of the first 10 weeks of school. Teachers were asked how much time they spent teaching nutrition, what topics were covered, and what resources were used. Their answers to the questions were compared against a model for using HONEY as advocated in the workshop. The model calls for a) allocating substantial amounts of time for nutrition learning (the criterion was an average greater than one hour per week); b) using HONEY materials; c) using materials from the NET Lending Library; d) covering at least four of HONEY's five content areas; e) involving the children in classroom cooking or food tasting activities; f) using the school cafeteria as a learning resource; and g) getting parents involved in their children's nutrition learning activities. The implementation score for each teacher was calculated by counting the number of points where responses to the questionnaire items matched the seven key implementation features of the model.

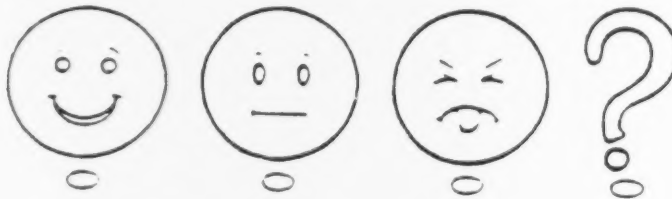
Three measures were made of learner outcomes: a) nutrition knowledge tests developed and pilot tested by AISD were administered before and after the specified 10-week instructional period in five kindergarten and four third grade classes, b) attitude scales (see Figure 1) developed and validated at Pennsylvania State University's nutrition research center were administered before and after the instruction period in five kindergarten and five third grade classes; and c) a food choices activity was conducted in all 19 classes at the close of the instructional period. Reliability coefficients for the twenty-item multiple-choice knowledge tests were .53 and .72 for kindergarten and third grades, respectively (Kuder-Richardson formula 20). For the Likert-type 3-point attitude scales, reliability coefficients for kindergarten and third grade were .66 and .72 (Spearman-Brown split half formula).

Food choice behavior was measured by counting the number of "good" selections made from tray of snack food items presented during a "food tasting party" held in the classroom at the conclusion of the first 10 weeks of school. Children came one at a time to the tray containing servings of grape juice, red soda pop, nut-and-raisin mix, presweetened cereal, celery with cheese, and cheese-flavored puffs. This array of choices was based on expert opinions about food items with comparable familiarity,

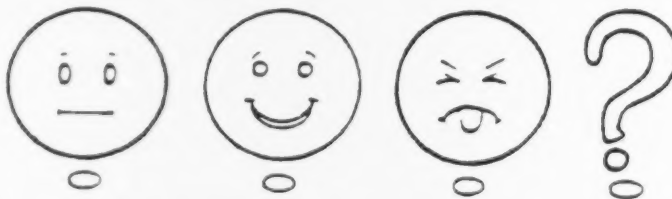
Figure 1

Sample Items From the Nutrition Attitudes Test

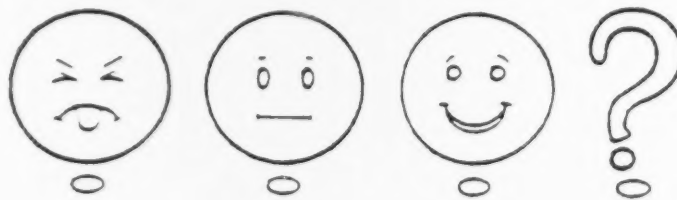
(1) How do you feel about foods that build teeth and bones?



(2) How do you feel about eating vegetables?



(3) How do you feel about tasting foods that you haven't seen before?



colors and aromas and on pilot testing of the procedures in a summer school session for young children. In the present study, children were instructed to choose one drink and one snack. A total of 365 children participated in the food tasting parties, generating 730 food choices. Tallies were kept of the "good" and "poor" food choices made by the children.

METHODS

Overview

Teacher training and pretesting took place during the second week of the fall semester. A ten-week instructional interval elapsed during which teachers could integrate HONEY into classroom activities. At the close of this ten-week interval, posttests of knowledge and attitudes were administered, children's food choices were evaluated, and teachers responded to a questionnaire inquiring about amount and characteristics of nutrition education in their classrooms.

Description of the Intervention

A one-hour in-service workshop was conducted on two of the four campuses, with separate sessions for kindergarten and third grade teachers. The workshop leader was a registered dietitian who regularly conducts workshops for the Texas NET Program. The sessions included: a) a basic overview of HONEY and steps for implementing the curriculum; b) guidelines for coordinating the curriculum with state-mandated essential elements of instruction; c) guidelines for using the NET library and d) instructions for conducting turnaround sessions for other teachers in grade-level teams on their respective campuses.

Teachers on the two campuses who participated in the workshops provided by NET were to provide turnaround sessions for others in grade-level teams on their campuses. No direct observation was made of the turnaround sessions.

Three copies of the HONEY notebook were placed with the principals at all four schools. Each of the 19 teachers participating in this study received a project packet that included notification that HONEY was available, and teacher and student research project consent forms. In addition, copies of test/scale

performance in each of HONEY's five content areas were returned to teachers by the end of the third week of school. It was expected that teachers would use this information as a guide in selecting lessons to be implemented during the 10-week instructional interval.

ANALYSES

HONEY implementation scores, knowledge test results, and attitude scale values were analyzed in two ways. First, criteria for acceptable performance were set and actual performance was compared to these criteria. Second, statistical significance of differences by grade and by method of teacher training were evaluated using analysis of variance procedures. Food choices were analyzed in separate chi-square tests of the number of good choices made by grade and by method of teacher training.

There were two criteria for acceptable implementation of HONEY: a) teachers were judged to be receptive to HONEY if they answered that HONEY was "nice to have" or that their students "really needed this kind of instruction," and b) teachers' use of HONEY was considered to be satisfactory if it matched at least five of the seven points in the model described earlier. Because there were only three classes per cell in the grade by teacher intervention method classification, separate analyses of variance were performed to evaluate differences between kindergarten and third grade and to evaluate differences associated with method of teacher training.

Criteria for evidence of acceptable levels of nutrition knowledge and attitudes were 70 percent favorable responses. On the knowledge tests, those who correctly answered 14 or more of the 20 questions were considered to have acceptable levels of nutrition knowledge. On the attitude scale, scores of 24 or higher were considered acceptable. Because knowledge tests were given to kindergarten and third grade students were not identical and because there were significant differences between campuses on the pretest, analysis of covariance was used to evaluate posttest scores with pretest scores serving as the covariate. Analysis of covariance also was used to evaluate the attitude data.

Scores on the knowledge posttest and the attitude measure were recorded as z-scores to enable inspection of the data sets for information about how levels of knowledge and attitudes were

related to fidelity of HONEY implementation and to food choice behavior. Anticipated results were that:

- workshops and turnaround sessions would result in better curriculum implementation and better learner outcomes than the notification method of teacher training;
- higher fidelity implementation of the curriculum would result in more improvement in knowledge and attitude scores; and
- higher levels of knowledge and attitudes would result in more frequent selection of good foods from the snack trays.

RESULTS

TEACHER RECEPTION AND IMPLEMENTATION OF HONEY

Eighty percent of kindergarten and 60 percent of third grade teachers indicated favorable attitudes toward HONEY (see Table 1). Across grades, only 30 percent of teachers reported they were neutral about HONEY or felt they had no time for it.

Kindergarten teachers reported greater use of HONEY materials and concepts than did third grade teachers. Fifty percent of the kindergarten teachers complied with five or more of the seven points in our model of effective use of HONEY, but only 10 percent of the third grade teachers achieved this criterion. The average implementation scores on the 7-point scale for the two groups were 4.6 (s.d. = 1.6) for kindergarten teachers and 2.8 (s.d. = 1.2) for third grade teachers. There was a statistically significant difference in implementation: $F(1, 13) = 8.43, p < .05$.

Across grades, compliance with specific points in the model were: a) 50 percent of the teachers averaged more than one hour per week on nutrition instruction, b) 95 percent reported using the HONEY curriculum, c) 65 percent used the NET lending library, d) 40 percent covered four or more of HONEY's content areas (food handling was covered least often, especially in third grade classes), e) 75 percent presented classroom cooking or food tasting activities, f) 20 percent included visits to the school cafeteria (but none included presentations by food service personnel), and

Table 1

Percentage of Teachers Responsive to HONEY Materials and Concepts

Group	(n)	Kindergarten (10)		Third Grade (9)		≠	Combined (20)	
		Acceptance	Use*	Acceptance	Use		Acceptance	Use
Workshop	(6)	100	70	30	30		80	50
Turnaround	(6)	100	70	30	0		60	30
Notification	(7)	50	20	70	0		60	20
Combined ≠	(20)	80	50	60	10		70	30

* Use = complied with at least 5 of 7 points in a model of effective use of HONEY.

g) 20 percent made assignments that involved parents in their children's nutrition learning activities.

All of the teachers at both grade levels reported spending at least one hour on nutrition instruction during the 10 weeks between pre- and posttests of their students' nutrition knowledge/attitudes. Fifteen percent (i.e., 1 kindergarten teacher and 2 third grade teachers) indicated they had devoted more than 20 hours to teaching nutrition during the 10 weeks. Teaching nutrition with health was the most frequent method of presentation: 8 of the 9 third-grade and 2 of the kindergarten teachers reported using this instructional strategy. Kindergarten teachers were more likely to integrate nutrition instruction into other subjects such as language arts and science: 6 of the 10 indicated having used this strategy.

The survey additionally revealed that HONEY was not used in isolation. Eight of the 9 third grade teachers and 3 kindergarten teachers reported using materials supplied by the Dairy Council and/or Heart Association to support nutrition instruction in their classes.

There appeared to be a trend toward more acceptance and use of HONEY in groups of teachers that had more intensive training. Half of those in the workshop group, for example, and only 20 percent in the notification group were identified by the model as criterion-level users of HONEY. The six kindergarten classes whose teachers participated in workshops and/or turnaround obtained an average score of 5.1 on the 7-point scale whereas the average implementation score was only 2.7 in third grade teacher-notification classes. Kindergarten teachers in the notification group achieved higher fidelity implementation of HONEY (their average score was 3.8) than third grade teachers who participated in workshops and turnaround sessions (their average was 3.2). These data demonstrate that implementation was not systematically related to intensity of teacher training (i.e., workshop, turnaround, notification).

Children's Knowledge Test Scores

The average percentage of correct responses on nutrition knowledge tests rose from 55 to 80 (see Table 2 for number correct data). On the pretest, fewer than one-fourth of the children met

Table 2

Number Correct on the 20-Item Nutrition Knowledge Test

Group	(n)	Kindergarten (64)		Third Grade (77)		Combined (141)	
		Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
Workshop	(48)	12	16	10	16	11	16
Turnaround	(54)	12	14	10	14	11	14
Notification	(39)	11	14	10	20	10	17
Combined	(141)	12	15	10	16	11	16

the criterion for an acceptable level of nutrition knowledge (i.e., 70 percent correct response). At the end of the 10-week instructional period, slightly more than three-fourths of them scored at or above this criterion. Approximately 10 percent achieved perfect scores on the posttest. The largest increase in scores occurred in third-grade classes whose teachers had the least training in how to use HONEY (notification group). Their pretest scores were comparable to those in other classes, but nearly all students in these two classes made perfect scores on the posttest of nutrition knowledge.

Analysis of covariance showed statistically significant differences by grade, teacher training, and an interaction of these two independent variables. Although posttest scores for kindergarten and third-grade students were about the same (means of 15 and 16 with standard deviations of 2 and 3), kindergartners started out with higher scores. Thus, it appeared that third graders learned more than kindergartners: $F(1,134)=37.81, p<.001$.

The frequency of criterion level performance on the posttest was 80, 60, and 80 percent for workshop, turnaround, and notification groups, respectively. Knowledge test performance of students whose teachers were in the turnaround training group improved less than in other groups, rising to an average of 3 more correct responses on the posttest than pretest, compared with increases of about 6 more correct for the workshop and notification groups: $F(2,134)=42.62, p<.001$. These main effects appear to be explained by the performance of third graders whose teachers were in the notification group: these were students who, although similar to other third graders at the time of the pretest, earned nearly perfect scores on the posttest: $F(2,134)=31.00, p<.001$. Thus, fidelity of implementation of HONEY was not systematically related to learner outcomes in the domain of knowledge.

Inspection of answers to specific test questions indicated improvement in all five of HONEY's curriculum content areas. Questions answered correctly most often on the posttests concerned sources of food, food choices, and meal planning. Although food handling was a topic teachers covered less often than the others, improvement in this content area was comparable to that in other areas, rising from approximately 40 percent to 75 percent correct responses. Percent correct in other areas averaged 60 on the pretest and 80 on the posttest. Scores were lowest for the topic of nutrients, averaging 35 and 60 percent correct on pre- and posttests, and highest for food choices with averages of 70 and 90 percent correct on pre- and posttests.

Children's Attitude Scale Scores

Across groups, students averaged 26 out of a possible 33 points on both the pretest and the posttest of nutrition-related attitudes (see Table 3). The percentages of students achieving criterion level performance (i.e., at least 24 points) on the posttest were 80, 60, and 60 in workshop, turnaround, and notification groups, respectively. Average scale values in classes whose teachers were in the workshop declined nonsignificantly from 27 to 25. Those in classes whose teachers had participated in turnaround training stayed the same at 24 points. However, students in classes whose teachers simply had been notified HONEY was available performed better on the posttest, earning 28 points compared with 26 on the pretest: $F(2,162)=9.97$, $p<.001$. This parallels the findings from the knowledge test, and in fact the two third-grade classes with near-perfect scores on the knowledge test also obtained higher scores on the attitude scale. Here again, fidelity of implementation of the HONEY curriculum did not appear to be related to pupil attitudes.

Although the overall scores showed no differences by grade, there were some interesting differences in the pattern of responses. Third graders were consistently less positive about tasting and trying new foods than were kindergartners. There were three items in this category. For all three items approximately 40 percent of kindergartners and 35 percent of third graders responded positively. However, third graders were more favorable than kindergartners toward eating spinach, broccoli, corn, foods that make you healthy, strong, and help build teeth and bones.

Children's Choice of Snack Foods

When, at the close of the first 10 weeks of the fall semester, students were given an opportunity to select one food and one beverage from a snack tray in the classroom, less than a third made nutritious choices. Of 730 selections (i.e., one beverage and one food choice for each of 365 children) only 173 (24 percent) were "good" choices. Kindergartners more often selected the less nutritious items than did third graders--only 12 percent of kindergarten choices were nutritious, while 33 percent of third grade choices were (see Table 4).

Thirty-three percent of third graders and 18 percent of kindergartners chose fruit juice instead of soda pop. Thirty-five percent of third graders and only 5 percent of kindergartners chose

Table 3

Average Number of Points Scored on 33-point Nutrition Attitudes Test

Group	(n)	Kindergarten (64)		Third Grade (77)		Combined (141)	
		Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
Workshop	(61)	25	23	27	25	27	25
Turnaround	(52)	23	24	25	24	24	24
Notification	(56)	25	26	27	29	26	28
Combined	(169)	24	25	27	26	26	26

Table 4

		Percent Choosing Grape Juice Instead of Red Soda Pop			Percent Choosing Celery/Cheese or Peanuts/Raisins Instead of Cheese- Flavored Puffs or Presweetened Cereal		
Group	(n)	Kinder- garten (168)	Third Grade (197)	Combined (365)	Kinder- garten (168)	Third Grade (197)	Combined (365)
Workshop	(122)	23	33	29	8	23	16
Turnaround	(120)	9	41	26	5	27	17
Notifi- cation	(123)	24	25	24	3	54	30
Combined	(365)	18	33	26	5	35	21

a fruit or vegetable snack instead of cheese-flavored puffs or presweetened cereal. These differences were statistically significant: $\chi^2(1)=9.2$ and 44.6 , $p<.05$ and $.001$ for beverage and food choices, respectively.

Because the majority (54 percent) of third grade students in classes whose teachers were in the notification group selected the fruit or vegetable snack, there was a significant main effect for training group: $\chi^2(2)=9.0$, $p<.05$. It should be noted that all teachers in this cell reported using the Dairy Council or Heart Association materials in addition to HONEY, that student performance on the posttest of nutrition knowledge was nearly perfect in these classes, and that there was a slight increase in scores on the attitude scales for these students.

In summary, implementation of HONEY was better in kindergarten classes but food choices were better in third grade classes, irrespective of type of teacher training. Students' nutrition knowledge and attitudes were not related to implementation of the curriculum or to their food choices behavior.

DISCUSSION AND CONCLUSIONS

Children's need for the kind of nutrition instruction offered in HONEY is indicated by the generally low scores on pretests of nutrition knowledge and by the frequency with which students failed to select nutritious snacks in the food choices activity. At the beginning of school, only about one-fourth of the students gave correct answers to at least 70 percent of the questions on the knowledge test. But after 10 weeks of school more than three-fourths of them met the 70-percent-correct criterion for acceptable levels of nutrition knowledge. Approximately 10 percent made perfect scores. These results show that children initially did not know but were able to learn things they need to know about nutrients, sources of food, food handling, and meal planning.

Despite improvements in their nutrition knowledge, the majority of children in this study failed to select nutritious snacks when presented with a limited choice food selection activity. Overall, fewer than 25 percent of their selections were "good" choices. Kindergartners were especially prone to choosing items with relatively lower nutrient density--only about 10 percent of their choices were good ones. This result was surprising because the

research literature had suggested that younger children would choose more nutritious foods.

One possibility for explaining the infrequency with which children selected the better foods in this study is the "party" atmosphere of the activity. Children were told this was a "food tasting party" and may have taken this information as tacit permission to indulge in "party" foods. If they had made their selections in an atmosphere that emphasized taking nourishment rather than enjoying a novel experience, the children may have made more nutritious choices.

Differences in performance between kindergarten and third grade suggests that effects of nutrition education are cumulative across years of instruction. The fact that teachers, especially kindergarten teachers, were so receptive to HONEY and that so many of them reported using nutrition-related instructional materials from the Dairy Council or Heart Association may indicate they taught food and health even before development of state-adopted essential elements of the elementary curriculum and HONEY. If so, third grade students had the advantage of nutrition learning in earlier grades; i.e., they may have performed better because they had accumulated more hours of nutrition instruction over their years in school. This explanation reinforces the importance of pressing for effective nutrition instruction in kindergarten with repetitions and expansions in later grades.

Another set of questions arises with regard to how and when nutrition education is integrated into the curriculum. Recall that 8 out of 9 third-grade teachers incorporated nutrition instruction into health, while 6 out of 10 kindergarten teachers built it into language arts and science. Clearly one can speculate as to whether or not there are optimal places in the curriculum to introduce and reinforce nutrition education, as packaged in the HONEY materials and in relation to the other available nutrition education materials.

Yet another possible confounding factor, both in understanding and interpreting the results of this study, may have to do with the age and/or cognitive developmental level of the children who participated. Most third-grade students function at the Piagetian level of concrete operational thinking, whereas most kindergartners have not achieved this milestone. Developmental changes have been studied in children's understanding of health and illness causality (e.g., Defino, 1985); but the present study did not obtain data that would have enabled the investigators to determine if

differences in children's cognitive schema might be related to their food choice behavior.

Workshops and turnaround sessions did not lead, as had been expected, to better curriculum implementation or better learner outcomes. Implementation of HONEY was better in kindergarten than in third grade classes, regardless of type of teacher training. Improvements in knowledge test scores and performance on the posttest of nutrition attitudes were best in third grade teacher-notification classes, while food choices were better in third grade than in kindergarten classes across all types of teacher training. As a strategy for promoting effective nutrition instruction, simply notifying teachers that nutrition education materials are available appears to be at least as effective as brief (i.e., one hour) workshops for teachers.

Also contrary to expectation, better implementation of HONEY did not lead to better performance on knowledge tests, attitude scales, and food choices. Scores on posttests of knowledge and attitudes were toward the middle of the distribution in classes where HONEY had been used with greatest fidelity to the model, whereas test performance was best in classes where there was least compliance with the model for using HONEY. Also, food choices were uniformly better in third grade classes while curriculum implementation was most faithful in kindergarten classes. These data indicate that HONEY was not as effective as had been expected in promoting children's nutrition learning.

There are at least two alternatives for explaining these findings. The first possibility is that neither workshops nor HONEY is an especially effective educational intervention. Results of other studies counterindicate this explanation. NET Program workshops have been shown in several evaluations to be reliably effective in improving teachers' knowledge and attitudes about nutrition instruction for young children. Previous studies of HONEY demonstrated that this curriculum was attractive to teachers in AISD and that its use was associated with improved scores on knowledge tests.

An alternative explanation is that factors other than teacher training and quality of the HONEY materials per se were major determinants of nutrition instruction and nutrition learning in this study. Recent nutrition education research identifies the teacher's personal interest in nutrition and support from school administrators as factors which have major impact on implementation of nutrition curricula in public schools. It may be that differences in nutrition learning observed in this study are

explained by unmeasured differences in teachers' and administrators' interests in the nutrition learning of their students (recall that random assignment to groups was not possible). Further research of these kinds of variables, in addition to the curriculum integration and developmental issues raised earlier, is needed in order to develop better strategies for improving the process of nutrition education.

SUGGESTION FOR FUTURE PRACTICE

Because HONEY did not prove to be as effective as was expected, it seems advisable for NET Program staff to reevaluate desirability of promoting statewide adoption of this curriculum and consider, as an alternative, working collaboratively with the Dairy Council and/or Heart Association. Nutrition learning appeared to be best in classes where HONEY was used least. Performance on posttests of nutrition knowledge, attitudes, and behavior were superior in third grade teacher-notification classes. All three teachers in this group reported using materials from the Dairy Council and/or Heart Association.

A second reason for working more closely with agencies such as the Dairy Council or Heart Association in efforts to provide elementary school teachers with nutrition training and materials is the finding that notification is as effective as brief workshops for promoting use of specific nutrition education materials. In order to notify as many teachers as possible about materials and training resources available through the NET Program as well as through other agencies, it will be advantageous for all concerned to use communication networks in each other's organizations.

A final implication of results of the present study is that additional research and development are needed to describe a more comprehensive theory linking expenditure of NET resources with improved nutritional status of children. A fuller understanding is needed of factors that influence teachers' decisions concerning when and how to use particular materials and teach specific nutrition topics in relation to the broad curriculum. More information also is needed about how children's nutrition learning experiences in the classroom influence their food choices. NET Program staff should be encouraged, therefore, to participate in research and professional development activities that will lead to better theory and thereby to better nutrition education and training practices.

REFERENCE

Defino, M.E. (1986). Factors influencing children's concepts of health and illness (Doctoral dissertation, The University of Texas, 1985). Dissertation Abstracts International, 46.